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IS 1991-8 (1987): Safety requirements for the use, care and protection of abrasive grinding wheels, Part 8: Special speeds [PGD 9: Abrasives]

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Indian Standard

(Reaffirmed 2002)

SAFETY REQUIREMENTS FOR THE USE, CARE AND PROTECTION OF ABRASIVE GRINDING WHEELS

PART 8 SPECIAL SPEEDS

(Second Revision)

Abrasives Sectional Committee, EDC 13; Grinding Wheels Subcommittee, EDC 13 : 1 [Ref : Doc : EDC 13 (4720)]

1. Scope — This standard (Part 8) covers the maximum safe operating speeds. This standard also defines the responsibility of the wheel manufacturers, machine builders (including one who converts, changes or otherwise alters a grinding or cutting off machine from the design or purpose originally supplied by the builder), and the users of the wheels and machines. It may be noted that these areas of responsibility apply to those wheels and machines operated at special speeds, that is, those speeds which are specified in this part of the standard.

The grinding or cutting-off operations performed with bonded abrasive wheels on many different types of machines are extremely important factors in industrial productivity. It is essential that wheels be operated and that machines be designed in accordance with the sections of this standard and that the users of wheels and machines observe the safety measures as applicable to them. The cooperation of all the parties should materially aid in promoting the safe use, care and protection of abrasive wheels.

2. Requirements for Special Speeds — Special high speeds as listed in Table 1 for specially designed and fully protected machines have been established for cutting-off wheels, tread grinding, crank grinding and cam grinding. These special applications and others not listed in Table 1 are subject to the following three conditions A, B and C and are not approved except on adequate fully protected machines.

2.1 *Condition A — The Wheel Manufacturer* — The wheel manufacturer shall make certain that the wheels are of adequate strength, have been tested at a suitable overspeed in accordance with **3.1**, and bear the wheel manufacturer's approval of the higher speed.

The wheel manufacturer should do such testing as he deems necessary to establish an adequate factor of safety before approving the wheel for the higher speed. The wheel should be marked that it has been approved for high speed application under specific conditions of use.

Note — The safe operating speed of a mounted wheel depends upon the diameter and length of mandrel, the size of the wheel and the overhang.

2.2 *Condition B — The Machine Builder* — The machine builder shall make certain at the time of manufacture that the machine is of suitable design and adequately guarded for the operation in question.

It shall be the machine builder's responsibility to consult a wheel manufacturer to determine that a wheel for the special speed application can be manufactured and tested in accordance with the requirements established at **3.1**.

The machine builder should be sure that the components of the machine such as spindle, bearings, guards, flanges, horsepower, etc, are adequate for the grinding operation in question. Because of design and composition limitations, certain abrasive wheels will not be suitable for special speed operations. It is, therefore, important that the machine builder and the abrasive wheels manufacturer cooperate to make certain that a wheel of adequate strength can be manufactured for the operation in question.

2.3 *Condition C — The User* — The machine user shall make certain that the machine is operated with approved safety guards and that the machine is maintained in a satisfactory condition.

The minimum guard requirements of Part 4 of this standard should be met. Where guard data for the wheel size and operating speed to be used is not available, requirements should be established by actual test. The machine user should also maintain machines in good condition for continuing safety (*see* Part 3 of this standard).

3. Wheel Manufacturer's Responsibility — It shall be the wheel manufacturer's responsibility to speed test wheels required for special speeds and so identify them as given in **3.1** and **3.2**.

It is important that wheels used at special speeds be tested and identified for use at the proper maximum operating speed.

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TABLE 1 SPECIAL MAXIMUM SPEEDS

(*Clause* 2)

Classification No.	Type of Wheel	Maximum Speed (m/s)					
		Vitrified Bond			Organic Bond		
		Low Strength	Medium Strength	High Strength	Low Strength	Medium Strength	High Strength
1	Cutting-off wheels: Larger than 400 mm dia (including reinforced organic)	—	—	—	48	60	71
2	Cutting off wheels: 400 mm dia and smaller (including reinforced organic)	—	—	—	48	60	80
3	Thread and flute grinding wheels	40	50	60	40	50	60
4	Crankshaft and camshaft grinding wheels	28	40	43	33	40	49

3.1 Manufacturer's Test — It shall be the wheel manufacturer's responsibility to speed test all wheels operated at speeds higher than the standard speeds as listed in Tables 1 and 2 of Part 7 of this standard.

For wheels not subject to the speed test, other means should be used to ensure adequate strength for the higher speeds.

Exceptions

Wheels that need not be speed tested are:

a) Wheels less than 100 mm in diameter,

b) Wheels with 100 mm diameter but less than 150 mm whose product of diameter times thickness is one or less,

c) Segments, and

d) Mounted wheels.

3.2 *Identification* — It shall be the wheel manufacturer's responsibility to identify wheels which may be run at special speeds.

Wheels approved for special speed applications should have the special speed indicated on the wheels, blotters, accompanying tags, stickers or container.

4. Machine Builder's Responsibility — It shall be the responsibility of the machine builder to design and construct those machine components which are concerned with the proper and safe operation of the grinding or cutting off wheels for the speed and the type of operation of which the machine is intended. Particular attention shall be given to the design of the wheel safety guards, wheel flanges and wheel mounting spindle as indicated in **4.1**, **4.2** and **4.3**.

The machine builder should decide upon the fitness of the machine for the proposed operation. If it becomes necessary or desirable to convert, change or alter the machine from the design or purpose for which it was originally made by the builder, it is important that the components involved with the use of the abrasive wheel be designed in accordance with the appropriate parts of this standard.

4.1 *General Machine Conditions* — If an existing machine is to be adapted for use at a special speed, the general machine conditions given in Part 3 of this standard shall be observed and all component parts of the grinding machine shall be checked and, if necessary, modified or adjusted prior to operating at the special speed.

It is important to remember that the abrasive wheel is only one part of the grinding operation. When the speed of the wheel is increased, changes may be necessary in the machine (bearings, table traverse rates, guards, sensing devices, power, etc) so that the entire unit will operate safely at the special speed.

4.2 *Safety Guards* — Grinding and cutting off machines shall be equipped with safety guards in conformity with the requirements contained in Part 4 of this standard when applicable. When the operation is beyond the conditions for which guards in Part 4 of this standard were designed, the machine builder shall establish by test or calculation the adequacy of the guard.

Guards built in conformance with the instructions contained in Part 4 of this standard will have a safety factor which satisfies good engineering practice. When speeds in excess of those shown in Part 4 of the standard are used, either a stronger guard material or thicker guard members must be used. The increase in strength should be sufficient to maintain the proper safety factor.

4.3 *Flanges* — Flanges shall be of such a design as to satisfactorily transmit the driving torque from the spindle to the abrasive wheel and conform to all requirements given in Part 5 of the standard.

The driving torque is transmitted from the spindle through the flange to the wheel. Therefore, the minimum bearing area specified in Part 5 of this standard may be inadequate in these cases. The machine builder should determine by test that his design is adequate to perform its intended operation.

5. User's Responsibility — The user shall be responsible for proper handling, storage, and inspection of abrasive wheels after receipt, in accordance with the requirements given in Part 2 and 6 of this standard.

It shall be the responsibility of the user to maintain his grinding equipment in a safe operating condition at all times. Rules of safe operation of this equipment submitted by the machine builder shall be observed as well as those rules specified in other parts of this standard.

When an existing machine is altered by the user to operate at special speeds, the user shall assume all the responsibilities of a mchine builder as outlined in Part 3 of this standard.

The user shall fully inform all operating personnel that only wheels identified for operation at special speeds shall be used and that at no time shall the maximum speed of the wheel be exceeded.

Protection to operating personnel, as well as adjacent areas, shall be maintained at all times.

The maximum operating speed as determined by the manufacturer is dependent on the wheel shape and strength. The strength of a bonded abrasive wheel may be defined as the ability of the wheel to withstand rotational stress.

Under no condition should a wheel be operated faster than the maximum operating speed established by the manufacturer. This is the responsibility of the wheel user.

It is an important responsibility of the user to maintain grinding machines in a safe operating condition. Machine builders usually issue rules for the safe operation of their machines calling attention to areas that could be unsafe if the rules or signs are disregarded. The user should recognize the importance of instructing personnel concerning these safety warnings.

Furthermore, grinding machines are usually designed to perform certain specified operations. It is strongly recommended that the machine should be used only on these types of operations for which they are designed.

5.1 *Handling, Storage, and Inspection* — It shall be the user's responsibility to adhere to all the requirements given in Parts 2 and 6 of this standard.

It is important that all wheels be handled and stored correctly, and inspected carefully. It is recommended that wheels for special high speeds be stored in a separate or special area so that the personnel will be aware that they are for special applications.

5.2 *General Machine Conditions* — It shall be the user's responsibility to see that the machine is maintained in such a condition that all the requirements of Part 3 of this standard will continue to be adequate.

It is important that the maintenance of the machine be such that the equipment remains in the same condition as originally furnished.

5.3 *Safety Guards* — It shall be the user's responsibility to maintain the guards and other protection devices in good condition. The user shall also make provisions for adequate protection of the personnel in the operating area (*see* Part 4 of this standard).

When operating at special high speeds, the pieces of an accidentially broken wheel will have more force than those broken at lower speeds. It is, therefore, imperative that all guards and pretective devices be maintained in good condition and correctly replaced when removed. It is also important that adjacent personnel be protected by barriers, booths or segregated work areas.

5.4 *Flanges* — It shall be the user's responsibility to maintain flanges in good condition according to Part 5 of this standard.

A primary function of flanges is to transfer the machine power to the abrasive wheel and grinding operation. It is, therefore, important that flanges be maintained as defined in Part 5 of this standard. Flanges which are worn, warped or sprung can contribute to wheel breakage.

5.5 *Mounting* — It shall be the user's responsibility to see that all the rules given in Part 6 of this standard which apply to the particular operation, are observed.

It is extremely important that all wheels, regardless of speed of operation or the type of machine involved, be inspected before mounting and that all rules for safe mounting practices be observed (*see* Part 6 of this standard).

5.6 *General Operating Rules* — It shall be the user's responsibility to see that all general operating rules (*see* Part 9 of the this standard) that are applicable to the special high speed operation are observed. It shall also be the user's responsibility to follow any special operating instructions furnished by the machine builder.

In some instances, the machine builder will provide special operating instructions and/or place warning signs on his machines. These, as well as the general operating rules listed in Part 9 of this standard should be followed to ensure a safe grinding operation.

EXPLANATORY NOTE

The safe operation of abrasive wheels requires the understanding and cooperation of many diverse groups and of all individuals concerned with their use or operation. This has been the basic viewpoint in establishing these safety requirements for the guidance of manufacturers, users and others involved in handling these products.

A thorough knowledge of nature and characteristics of abrasive wheels, the grinding machines on which they are used and the safety and protection devices which can and shall be used to limit, if not eliminate, injury or damage in case of accidental wheel breakage, is necessary for proper understanding of thess safety requirements. These safety requirements may be used as a guide and not as an alternative to constant educational programmes at all levels which are the best insurance against those unforeseen conditions or circumstances which result in an industrial accident.

The mandatory requirements are printed in normal (10 points) type and the explanatory information in smaller (8 point) type. This is intended to facilitate a condensed document of mandatory requirements together with supporting tables and a figure. The explanatory information gives the basic reasons for the rules to encourage their implementation in practice. However, it may not be termed as part of the standard. The explanatory material has been included to encourage compliance and it is given only where it amplifies or clarifies a requirement.

Operating rules are not included in these safety requirements unless they are of such a nature as to be important safety requirements equal in importance to other requirements included in this standard. This standard was first issued in 1962 and its first revision was taken up in 1973, based on ANSI B 7.1-1970.

In order to review the individual section at any time and also for technical and drafting reasons alike, this standard has been split up in the following ten parts:

Part 1 Scope and definitions
Part 2 Handling and storage
Part 3 General machine requirements
Part 4 Safety guards
Part 5 Flanges
Part 6 Inspection and mounting
Part 7 Standard speeds
Part 8 Special speeds
Part 9 General operating rules
Part 10 Mounted wheels

While splitting, this part (Part 8) of the standard has also been revised and the details have been made more explicit. More data has also been included.

While revising this standard, assistance has also been taken from the following publications:

'European safety requirement for the use, care and protection of abrasive wheels' issued by the Federation of European Producers of Abrasive Products (FEPA).

ANSI B 7.1-1978 'Safety requirement for the use, care and protection of abrasive wheels', issued by the American National Standards Institute, USA.

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